Wilderness Ecosystems Baseline Studies Interim Report 1994: Invertebrate community delineation and mapping of Bathurst Harbour.

Last, P.R. and Edgar, G.J. (Eds.)

a) Summary and Recommendations

An excursion to the Port Davey Estuarine System in April 1993 confirmed earlier evidence of distinct horizontal and vertical zonation patterns within the invertebrate communities of Bathurst Channel. The fauna, with its dominance of deepwater species, is unique in both community structure and composition within the entire coastal zone of Australia. The restriction of plant communities to near the surface, reflected by the low light penetration from dark tannin stained water, is an atypical situation within temperate Australian waters. The benthic invertebrate fauna is dominated by filter feeders such as corals, bryozoans, tube worms, ascidians and sponges. Marine groups, which are often dominant elsewhere in the sea, such as molluscs, crustaceans, and echinoderms, are relatively depauperate. The taxonomy of much of the fauna is still being resolved but initial indications are that it contains rare species, some of which may be endemic.

The communities contain many sedentary benthic species that are delicate and fragile. Many of these (eg bryozoans, corals, sea pens) are vulnerable to mechanical damage from divers or by nets and anchors. They also contain species that are not widely represented in adjacent inshore habitats and may be 'self-seeding' within the estuary. Many deepwater animals are habitat specific and may be vulnerable to environmental changes caused by pollutants, nutrient enrichment and other water quality factors. Gaining an understanding of water flow within the estuary is critical to evaluating the effects of such changes.

This study was little more than a pilot survey and generates more questions than it answers. The Channel harbours an extremely important but potentially vulnerable fauna which needs to be given high research and conservation priorities. While the basic structure of its communities have been identified, more subtle but yet undefined partitioning of zones appears to be evident. Resolution of these infrastructural elements

awaits further collecting and identification of the spatial patterns. Future research should attempt to delimit potentially vulnerable communities and their distributions, and identify less vulnerable sites where ecotourism and other man-related activities could be permitted without causing environmental damage.

b) Introduction

Previous surveys have highlighted the unusual nature of the inshore benthic communities of the Port Davey estuarine system (Edgar, 1984). Due to low light penetration through the dark tannin stained surface water, plant communities are replaced by sharply defined assemblages of invertebrates resulting in habitat types not represented in any other part of Australia. However, the true complexity of these habitats and the diversity of invertebrate filter-feeders which dominate them has not been widely appreciated or defined on a spatial scale.

The possible uniqueness of the benthic habitats of Bathurst Harbour and Channel was recognised during a recent WEBS funded expedition to the region (Project M2/139/43(1) by divers while searching for a new endemic skate. Benthic invertebrate communities appeared to exhibit clear subtidal zonation and a high degree of habitat complexity, with particularly high diversity (and possible endemicity) among coelenterates, sponges and bryozoans (Last, 1992). The community composition also appeared to change along the length of Bathurst Channel, presumably as a consequence of changing turbulence, light penetration, and salinity regimes. Equivalent habitats are not represented in coastal areas of any other part of Australia, including Tasmania, and more closely resemble those found in the fiords of southwestern New Zealand. In reality, these habitats are likely to be even more unique than the terrestrial habitats of the WHA adjacent.

The study report recommended that a thorough survey of Bathurst Channel be undertaken to define these habitats, identify dominant species, and to evaluate patterns of zonation within the estuary. In mid April of the following year, a expedition of the region was undertaken with the aim of providing further information on these unique assemblages. The primary aims of this survey were to:

* To investigate invertebrate community composition within Bathurst Channel and provide a broad classification of benthic biotopes

* To obtain representative taxonomic collections of invertebrates and resident fishes that comprise these communities

* To investigate changes in subtidal zonation patterns along the length of the estuary and, where possible, construct a generalized map of biotope distributions

* To quantify fish densities, and macroinvertebrate and macroalgal coverages, at several sites within the estuary

c) Methods

A group of eleven scientists and technicians travelled to the Port Davey estuarine system between 2-10 April 1993 to obtain baseline data on invertebrate communities within Bathurst Harbour and Channel. The group was based at Melaleuca and travelled to sample sites daily using three small vessels. Support on site was provided by a commercial supply boat, 'Wildwind'.

Biological collections were made using compressed air diving and trap samples; artificial lights were required for all dives as light penetration was almost zero below a few metres at most sites.
The group was divided into 3 teams: a taxonomic team responsible for the collection of representative fauna and obtaining in situ photographs of elements of the fauna; a team responsible for gaining an overview of spatial and geographic distributions of plant and invertebrate communities in the estuary; and a team which focused on quantifying fish densities, and macroinvertebrate and macroalgal coverages in the estuary.

i) Qualitative survey of benthic communities

Seven stations were selected along Bathurst Channel from Sarah Island to Bathurst Harbour. These locations follow site nomenclature of the RAN hydrographic charts (1978) for the region (AUS 175 and 176): 1. Sarah Island; 2. Forrester Point; 3. southern shore opposite Branson Point; 4. Little Woody Island; 5. Joan Point; 6. Eve Point; 7. Platypus Point (see Fig 4.). Each station was marked using ribbons onshore.

Table 5. Distribution of algae in Bathurst Channel.								
Algae species	**Site**							
	1	**1a**	**2**	**3**	**4**	**5**	**6**	**7**
Cyanophyta								
Blue green 1	*			*	*			*
Rivularia sp						*		
Rhodophyta								
Laurencia tasmanica	*	*						
Lenormandia marginata	*	*	*	*	*	*		
Thamnoclonium dichotomum	*	*	*		*			
Ballia callitricha	*		*					
Ballia scoparia	*		*					
Craspedocarpus sp	*							
Hymenena sp	*							
Plocamium sp	*							
Polyopes ? sp	*							
Delisia fimbriata		*		*				
Red 3			*					
Polysiphonia cf monacanthum			*	*	*	*	*	
Red 1				*		*		*
Gigartina sp				*				
Red 2					*	*	*	
Lophurella sp					*	*		
Laurencia botryoides					*			
Rhodoglossum sp								*
Phaeophyta								
Hormosira banksii	*	*	*	*	*	*	*	*
Ecklonia radiata	*	*	*	*	*	*	*	*
Carpoglossum confluens	*	*	*	*				
Sargassum sp 1	*	*	*					
Macrocystis pyrifera	*	*						
Xiphophora gladiata	*	*						
Durvillaea potatorum	*							
Dictyopteris muelleri		*		*	*			
Cystophora sp 1		*						
Sargassum verruculosum		*						
Zonaria turneriana		*						
Ectocarpus sp			*				*	
Sargassum sp 2			*					
Sporochnus sp					*	*	*	*
Brown 1							*	
Chlorophyta								
Ulva sp	*	*	*	*	*	*	*	*
Chaetomorpha coliformis	*	*	*	*	*	*		
Codium pomoides		*	*	*	*			
Codium fragile		*	*	*	*			
Enteromorpha intestinalis								*
Angiosperms								
Heterozostera tasmanica						*		

Graduated 50 m line transects were set perpendicular to depth contours at each site. Hydrological data was obtained using a salinometer capable of profiling both temperature and salinity. Video coverages were made of each transect line then generalised footage of the biota was obtained from nearby at each major depth interval. Depth profiles were obtained along the line with records at 3 m intervals using depth gauges. Faunal compositions were recorded concurrently. These data were plotted in site profiles 1-7 (Fig 3,1-7).

Ad hoc transects and hydrological sites were established in embayments off Bathurst Channel and in Bathurst Harbour to provide a profile of invertebrate distributions throughout the estuary. All together 26 sites were sampled. These will be converted into broad-scale maps when supplemented with data obtained during a follow-up survey.

ii) Quantitative survey of benthic communities

In order to adequately estimate the densities of different components of the biota, three different transect techniques were needed at each site. These techniques were the same as used by the Tasmanian Division of Sea Fisheries in their surveys of marine life in other reef areas around the Tasmanian coast.

Mobile fishes were firstly censused by laying out a 50 m line parallel with the 5 m depth contour and then swimming along each side of this line at 2.5 m distance. Fishes sighted within 2.5 m of the diver (i.e., within a 5 m x 100 m area) were listed on an underwater notepad as they were observed and their length estimated. Cryptic fishes and large mobile invertebrates were next censused by slowly swimming beside the transect line, carefully searching for these species within 1 m of one side of the line (i.e., within a 1 m x 50 m area). Rocks were not overturned during this search but macroalgae were moved aside and animals observable within caves recorded. The cover of macroalgae and sessile invertebrates were lastly estimated by placing a 0.5 m x 0.5 m quadrat on the transect line at 10 m intervals (i.e., covering a total area of 5 x 0.25 m^2) and estimating the percentage cover of the different species.

A total of eight sites were surveyed in the region: Saddle Bight, Breaksea Island, Sarah Island, Forrester Point, Little Woody Island, Joan Point, Eve Point and Celery Top Island (see Fig. 4). All three survey techniques are replicated four times at each site.

iii) Taxonomic collections -

A team of taxonomists and photographers from the South Australian Museum (SAMA) supervised the systematic collections of invertebrates. Several sites in the main channel and harbour, including all numbered sites, were hand sampled on SCUBA. Specimens were retained for South Australian Museum collection, Adelaide, with vouchers soon to be donated to the Tasmanian Museum, Hobart. Specimens were sent to appropriate specialists for identification.

As many species as possible were photographed in situ before collection, and the specimens and images cross-referenced in the S.A. Museum Marine Invertebrates Section Photoindex. Additional photographs were taken by Fred Bavendam, a volunteer with the Section. Duplicate UW slides and video footage will be donated to DPWH. Baited traps were set at several sites overnight.

d) Preliminary Results and Discussion

The survey was very successful and despite bad weather (wind strengths 5-7 for half of the survey period) research teams met or exceeded their original objectives. An overview of the results is provided below. More complete summaries will be provided in technical papers after primary identifications have been completed.

i) Hydrology -

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Site information is provided in Table 4. Salinity and temperature profiles are provided at major sample sites (Figs 1 & 2).

From April 2-6 the Channel was weakly stratified with a salinity gradient at 1.8 -2.5 m. The upper layer was evenly polyhaline (26.6-28.9 ppt) with deeper parts of the estuary being euhaline (33.9-34.5 ppt at sites 1&2; 32.5-33.6 ppt in the upper estuary). Rain and strong winds from April 7 resulted in the euhaline layer being lowered to 6-12 m with gradual mixing in the upper layer (surface salinity 11.5-27.8).

Figure 1a

Water Temperatures at each major sampling site in Bathurst Channel at time of sampling

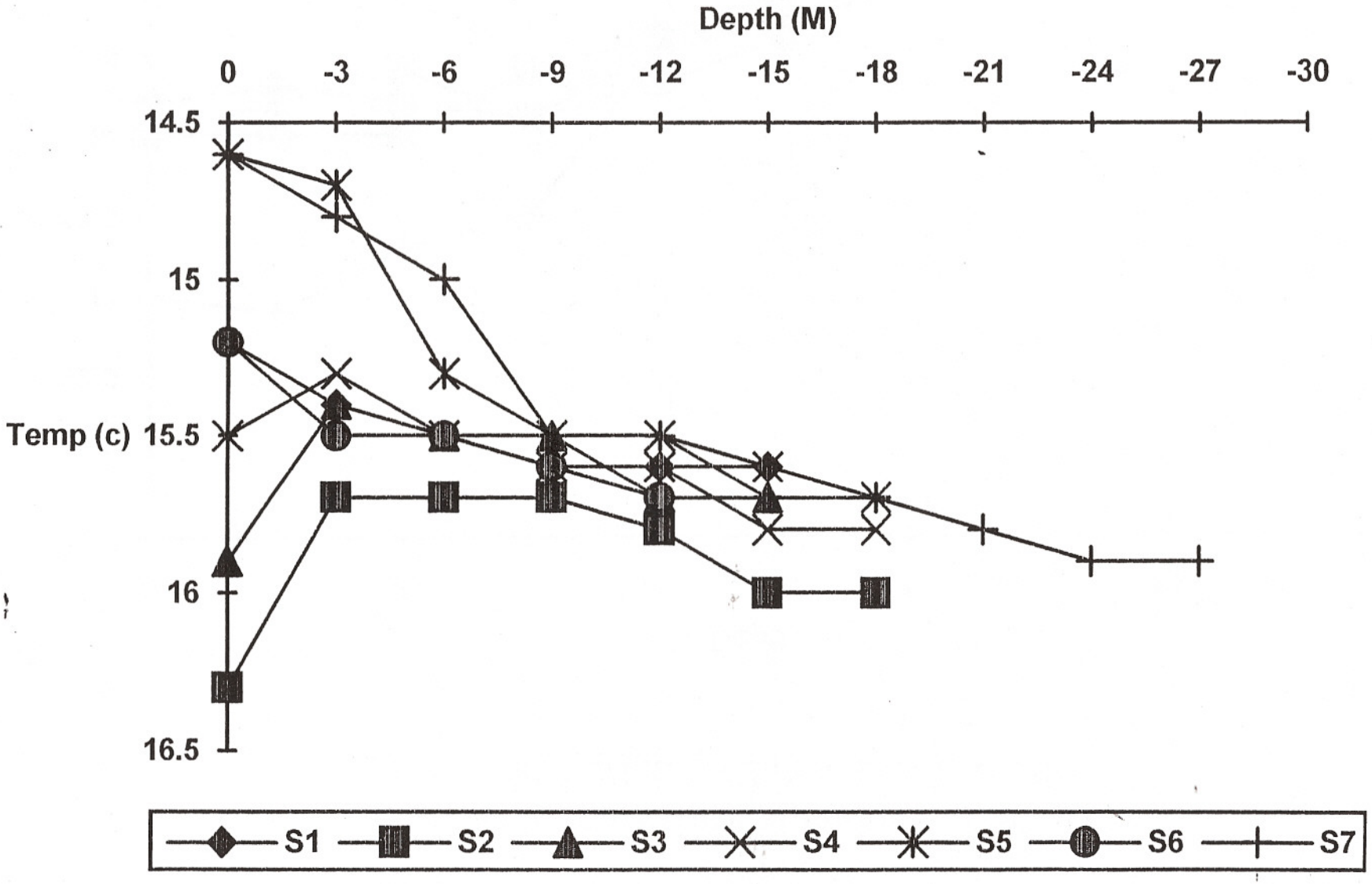


Figure 1b
Water temperature at major sampling sites of Bathurst Channel on 8 April.

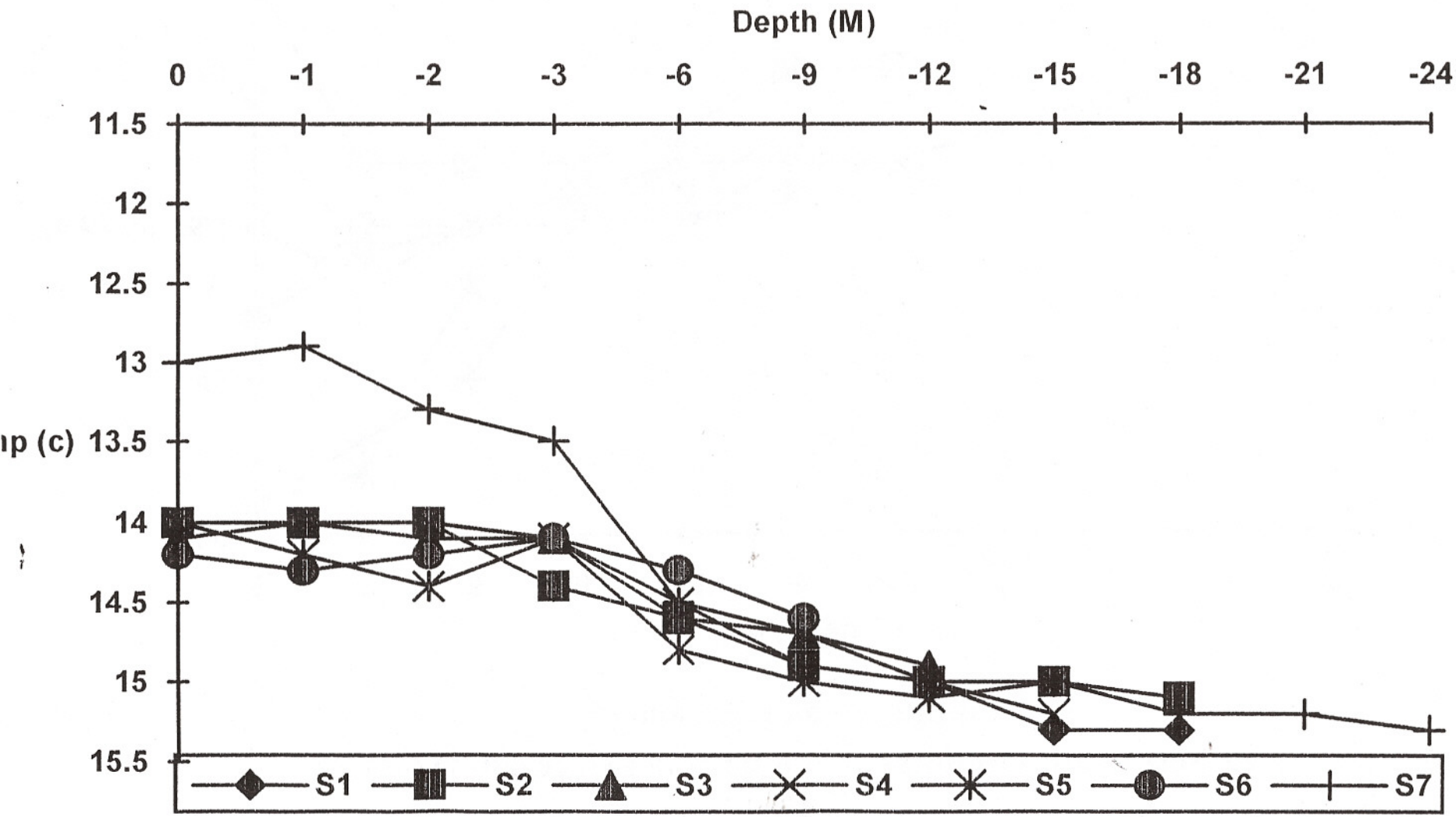


Figure 2a

Salinity at each major sampling site in Bathust Channel at time of sampling

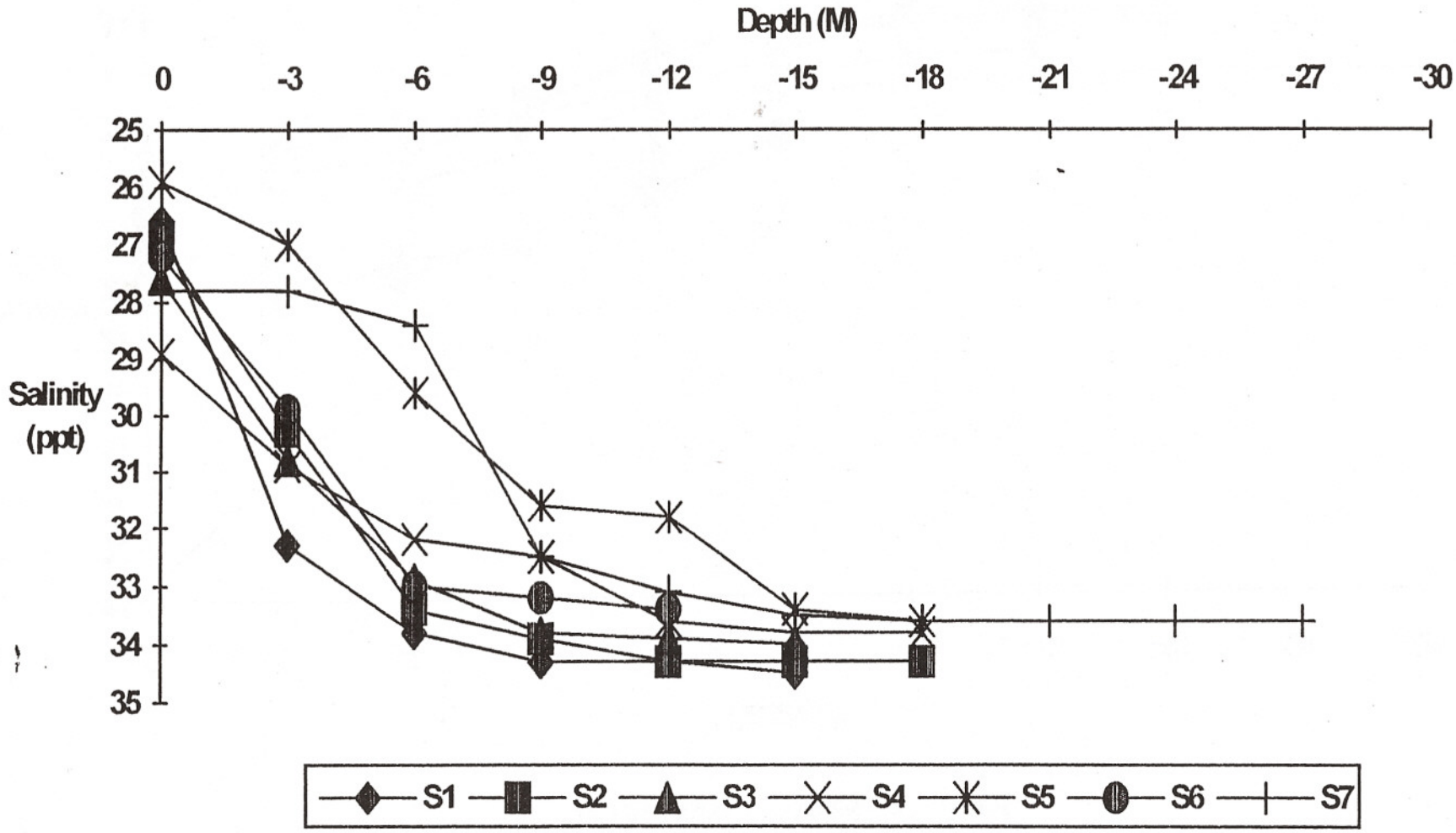
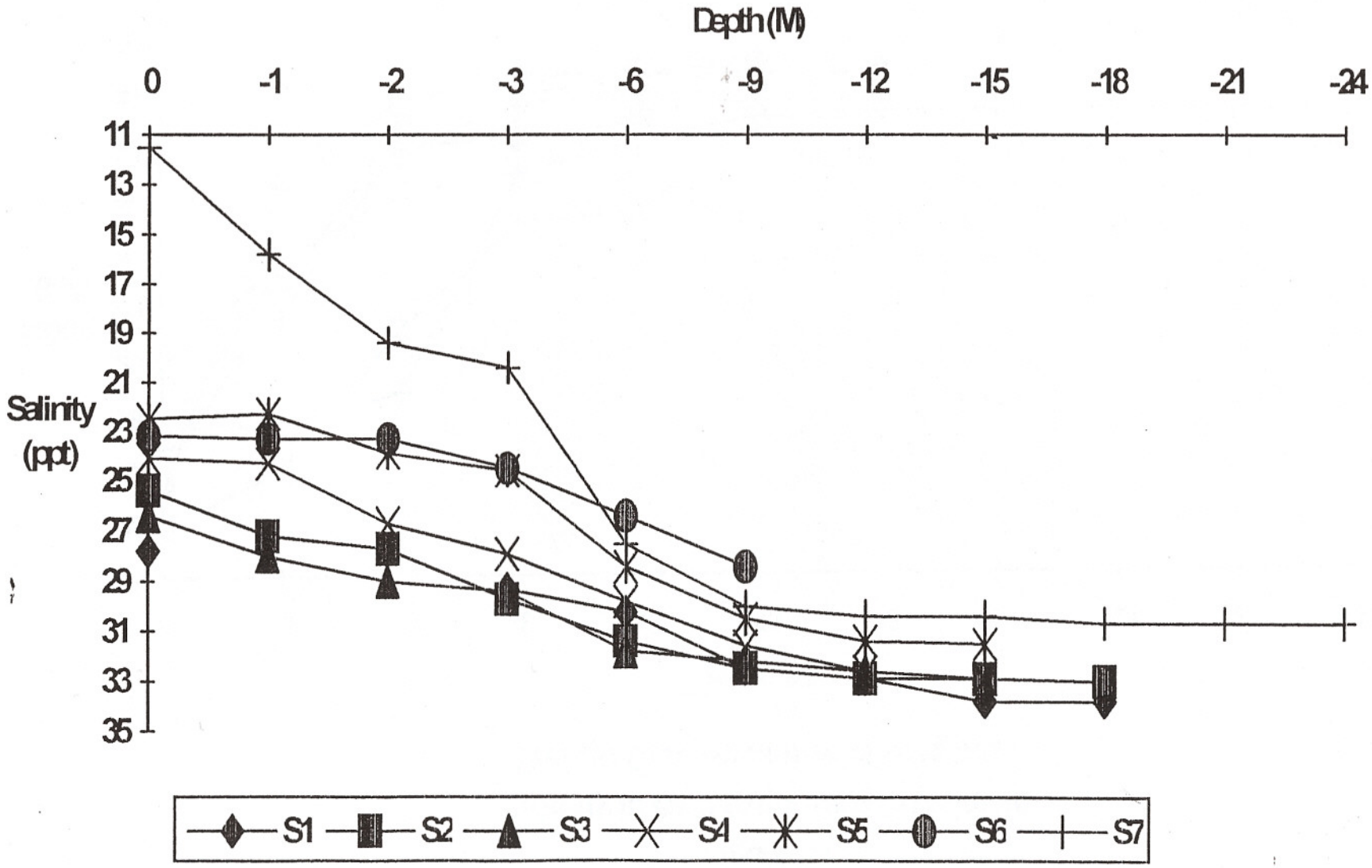


Figure 2b
Salinities at major sampling sites of Bathurst Channel on 8 April



Temperatures ranged from 15.2-16.3°C from April 2-6. Surface temperatures were lowered dramatically to 13-14.8°C after rainfall near the end of survey. At the same time, bottom temperatures were reduced by about half a degree (below 12 m: 15.6-16°C to 15-15.3°C)

Surface turbidities ranged from 1.8-2.4 m.

ii) Benthic communities (qualitative features) -

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Distinct invertebrate and plant assemblages were recognised at all sites and these varied according to position in the estuary and with depth. Generalized distribution patterns of the channel biota are represented for each site along bottom profiles (Fig 3. 1-7). Major features of the biota include:

Photic Zone (Algal belt)

* Algae occur to a depth of less than 5 m near the entrance of the channel (site 1). Their depth distribution diminishes further upstream as light penetration is reduced; attached plants are confined to less than 1 m at site 7.

* More than 40 plant species were collected (2 Cyanophytes, 18 Rhodophytes, 15 Phaeophytes, 5 Chlorophytes and 1 Angiosperm) (see Table 5).

* The number of species penetrating the channel diminishes progressively upstream. Some marine algae occur only at the channel entrance.

* Intertidal fringe is dominated throughout the channel by Hormosira and Ulva.

* Red algae penetrated deeper than other algal groups and dominated the lower sectors of the photic zone.

* The largest macrophytes were Macrocystis pyrifera, Durvillaea potatorum and Ecklonia radiata. Of these, Ecklonia penetrated farthest upstream (ie occurred at all sites but confined to immediate subsurface at Site 7). Macrocystis is represented in small stands

near the channel entrances upstream as far as Beaby Point. A smaller phaeophyte, Carpoglossum confluens was abundant in the upper third of the estuary.

* Seagrasses are poorly represented in the Channel and Harbour. Heterozostera has a restricted distribution in the Channel (only found in the mid estuary site) although additional stands exist in some adjacent embayments (ie Schooner Cove). Zostera muelleri occurs in dense stands further up the estuary (ie Melaleuca inlet).

Aphotic zone (Invertebrate communities)

Lower Channel (Sites 1, 2)

* fauna generally dominated by cnidarians (hydroids and octocorals) demonstrating generalized vertical zonation patterns

* rich and diverse band of small filter-feeding invertebrates at top of aphotic zone (4-6 m at S1 and 2-7 m at S2) and extending into red algae zone above (includes small plate and encrusting sponges, bryozoans, solitary ascidians).

* distinctive band from 6-9 m at S1 dominated by cnidarians notably orange gorgonia fans (nov. gen. plumacea), gorgonians (Acabaria), black hydroids (Solanderia fusca) and sea whips (Primnoella).

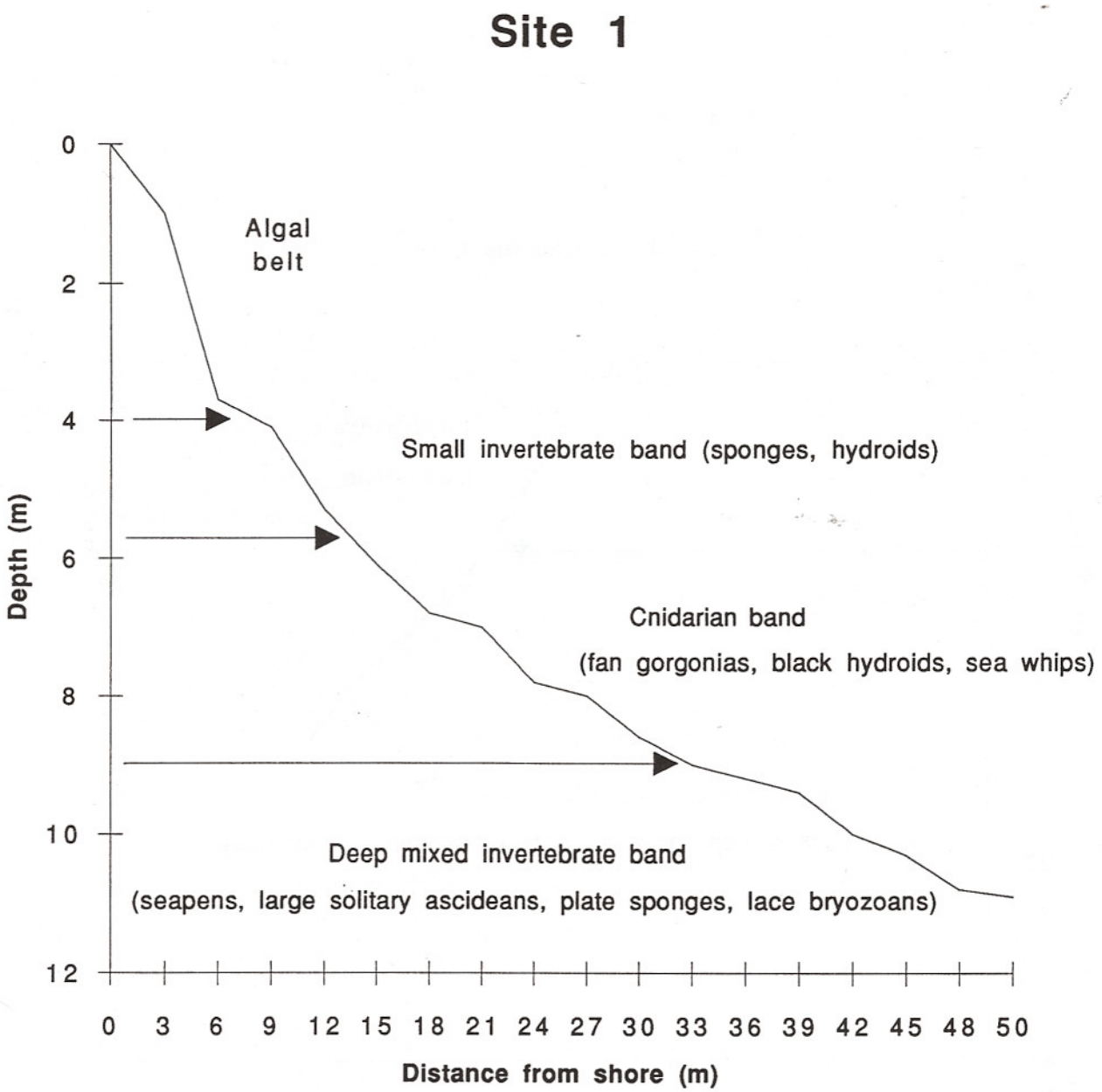
* distinctive band from 7-12 m at S1 dominated by cnidarians notably sea whips, soft corals (Capnella), zooanthids and hydroids.

* below 9 m at site 1 - macrofauna on sandy bottom dominated by sea pens (Sarcoptilus) and fine hydroid fans ; on rock clumps large cup sponges, finger sponges, lace bryozoans and large solitary ascidians (Herdmania).

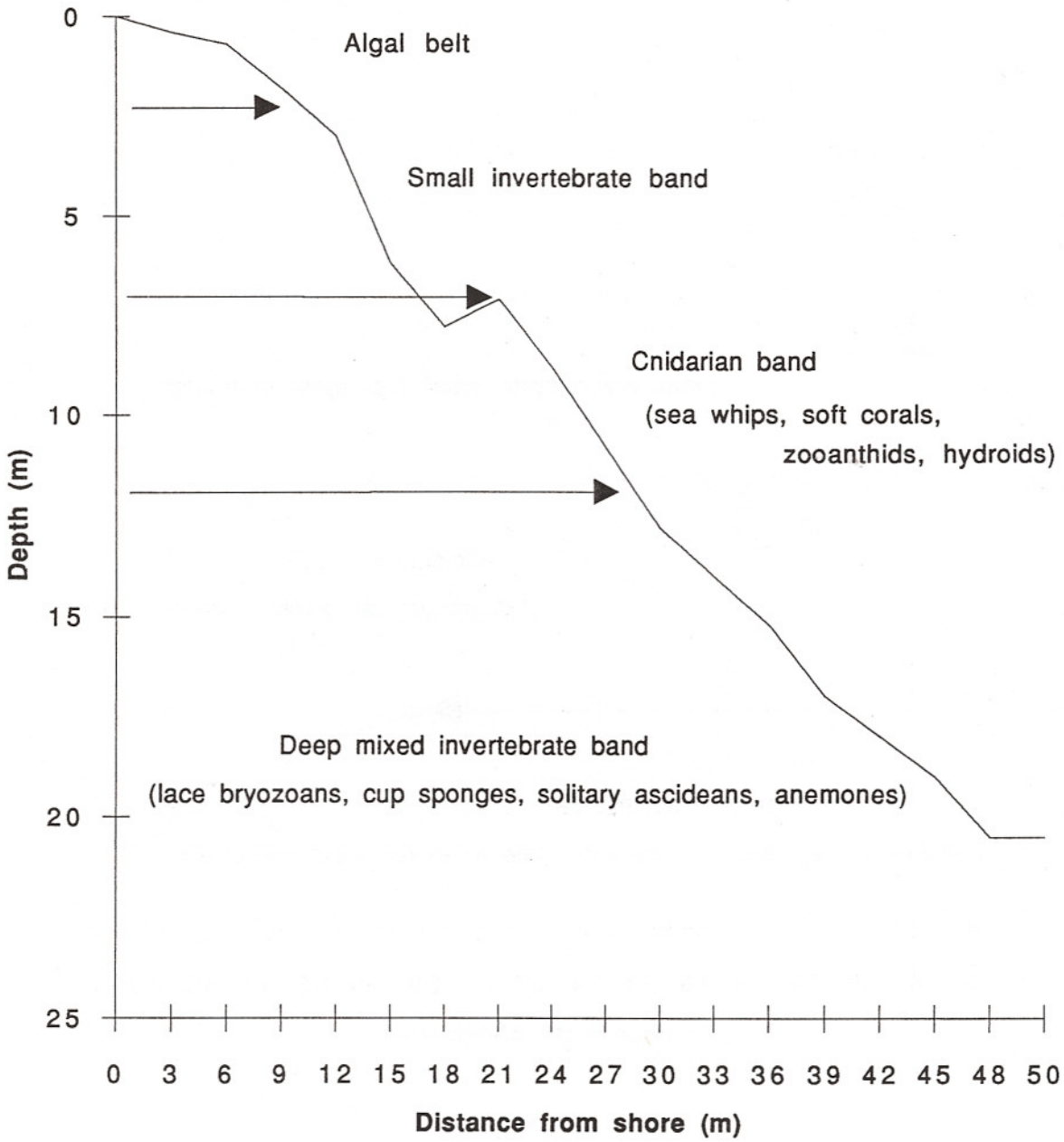
* below 12 m at site 2 - macrofauna on sandy bottom mostly barren with a few Cerianthus; macrofauna on rocks sparse but dominated by bryozoans, plate sponges (Cartieriospongia) and solitary ascidians.

Upper and Mid Channel (Sites 3-7)

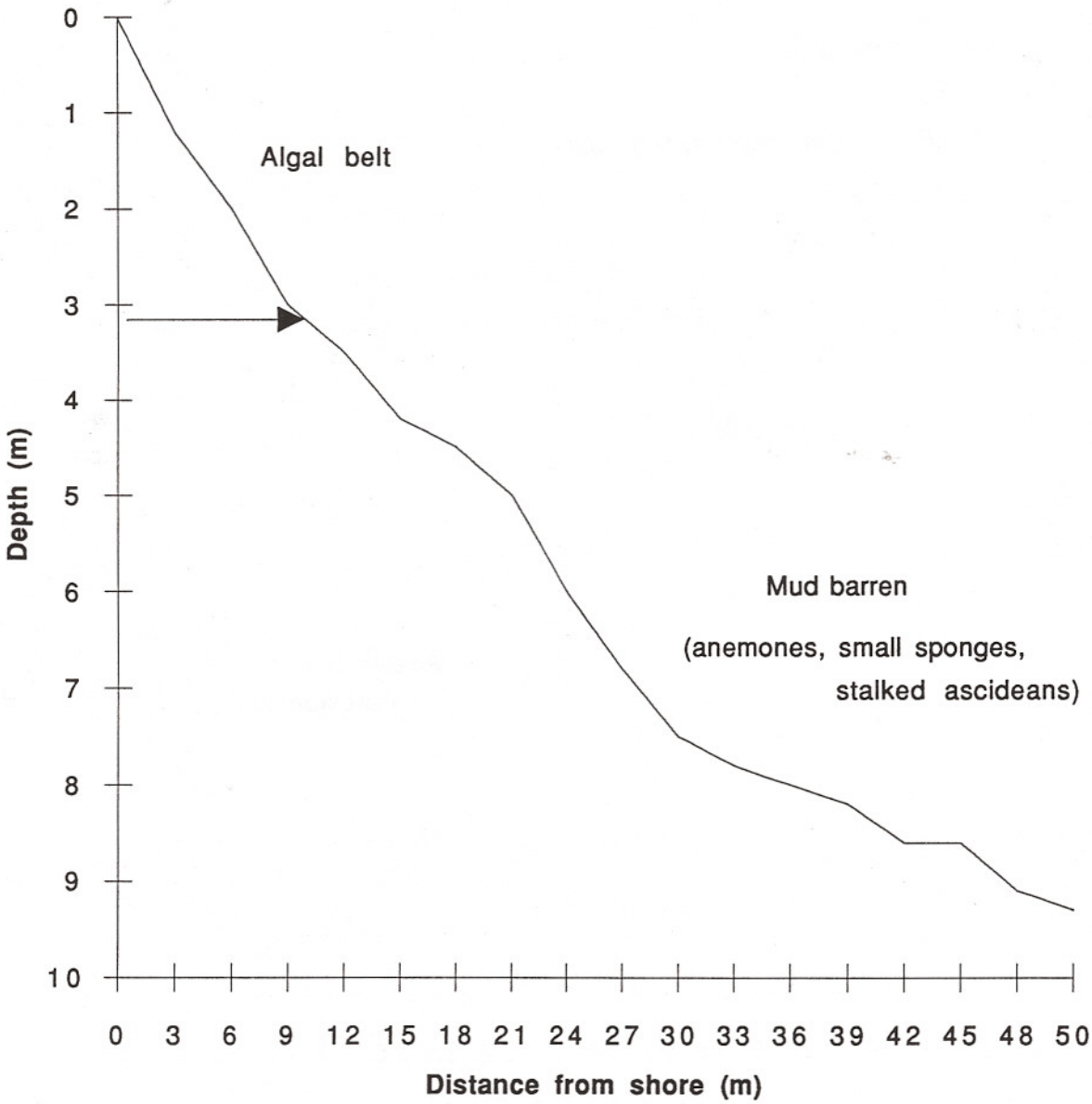
Fig 3.


Site 1
Depth (m)
0
2
4
6
8
10
12
Algal belt
Small invertebrate band (sponges, hydroids)
Cnidarian band
(fan gorgonias, black hydroids, sea whips)
Deep mixed invertebrate band
(seapens, large solitary ascideans, plate sponges, lace bryozoans)
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

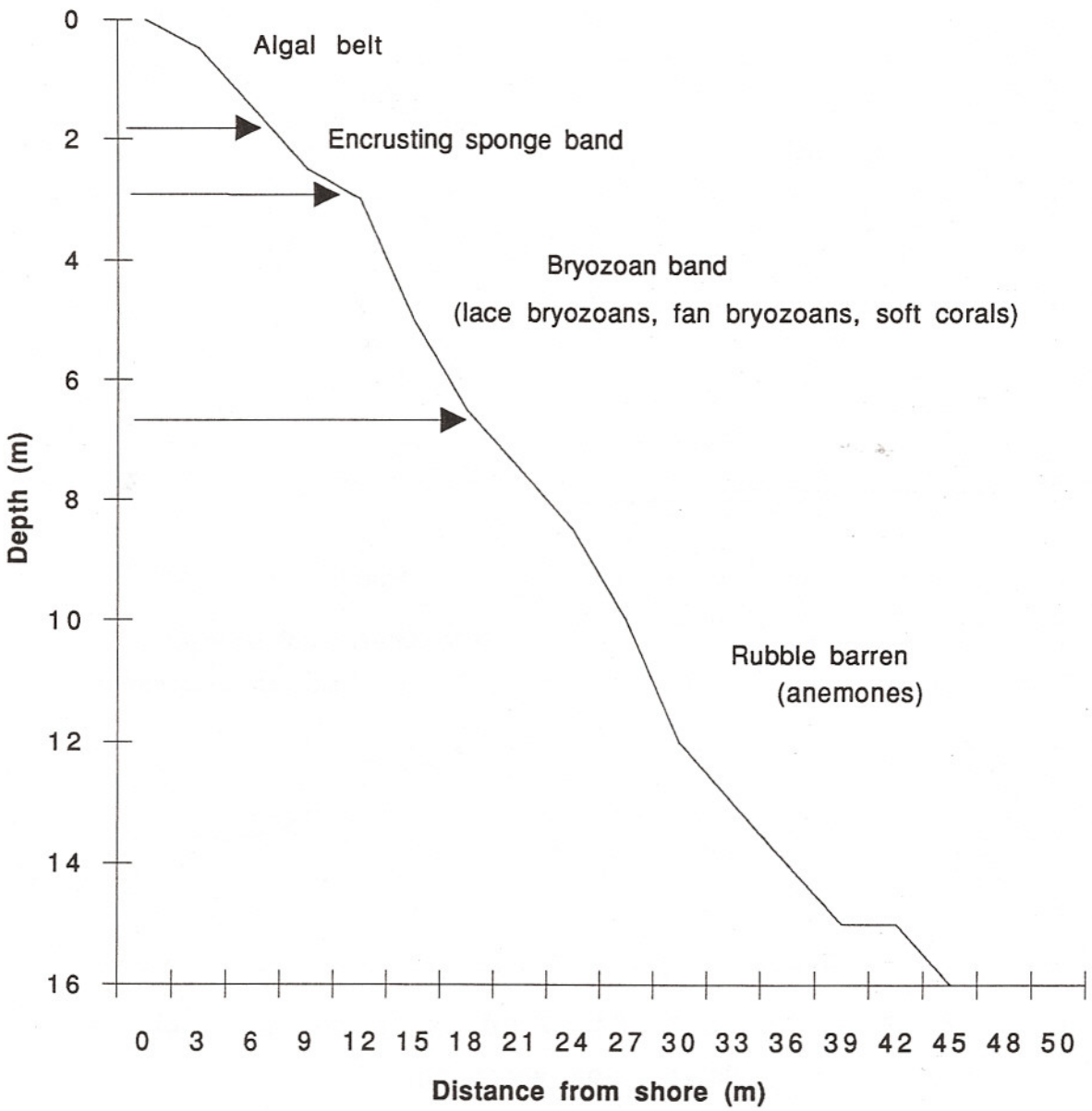
Site 2


0
5
10
15
20
25
Depth (m)
Algal belt
Small invertebrate band
Cnidarian band
(sea whips, soft corals,
zooanthids, hydroids)
Deep mixed invertebrate band
(lace bryozoans, cup sponges, solitary ascideans, anemones)
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

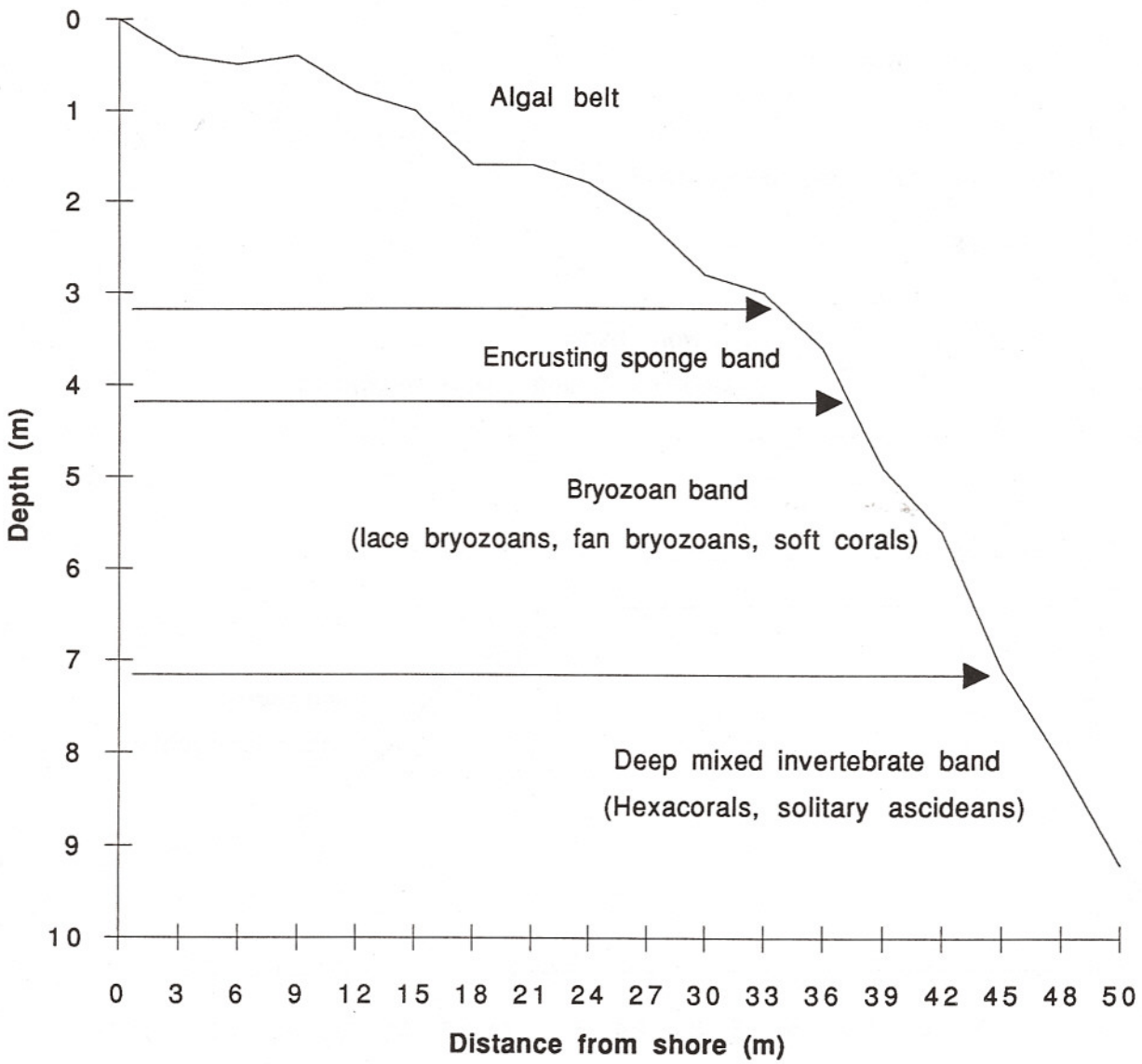
Site 3


0
1
2
3
4
5
6
7
8
9
10
Depth (m)
Algal belt
Mud barren
(anemones, small sponges,
stalked ascideans)
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

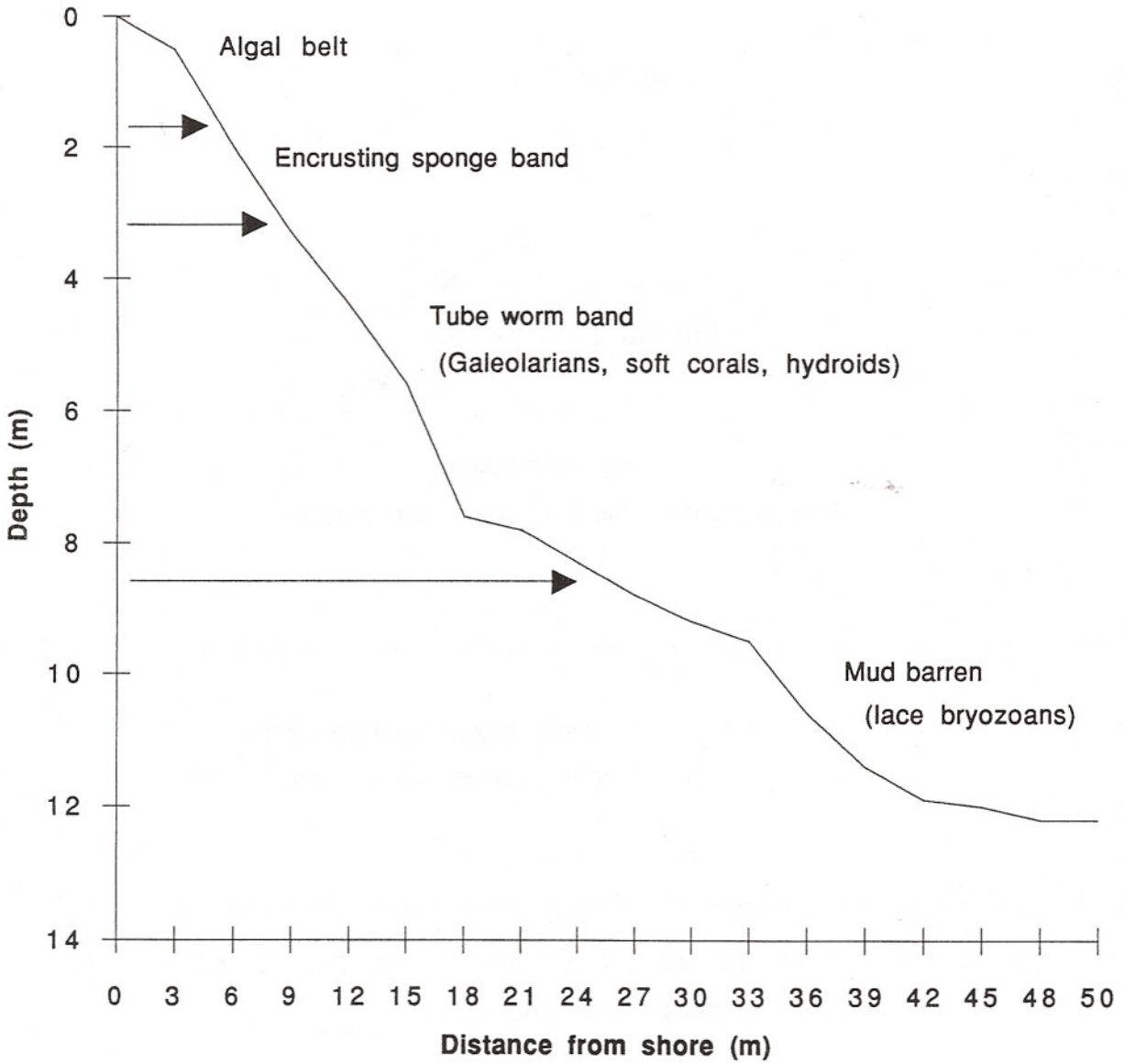
Site 4


Algal belt
Encrusting sponge band
Bryozoan band
(lace bryozoans, fan bryozoans, soft corals)
Rubble barren
(anemones)
Depth (m)
0
2
4
6
8
10
12
14
16
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

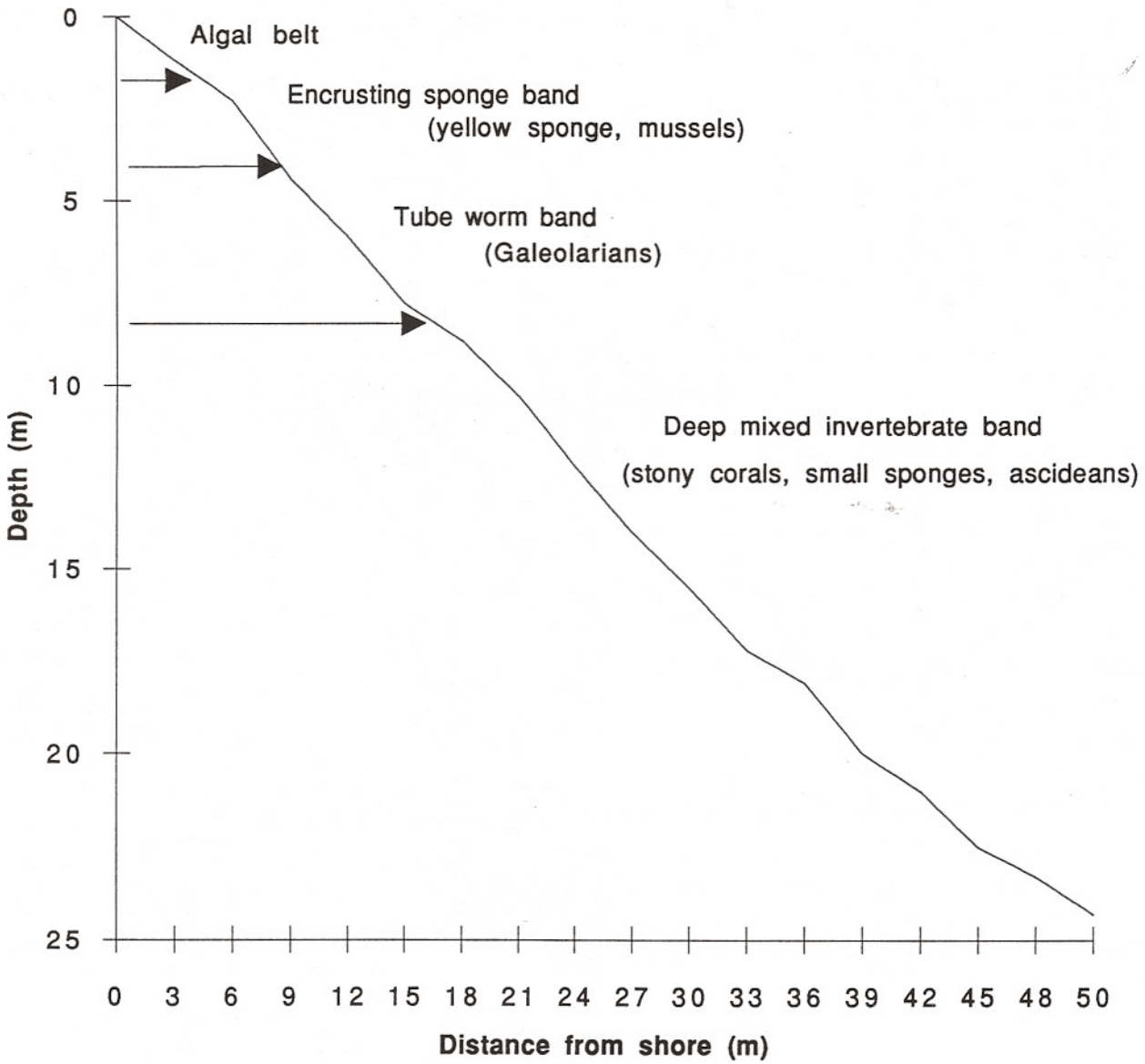
Site 5


Depth (m)
0
1
2
3
4
5
6
7
8
9
10
Algal belt
Encrusting sponge band
Bryozoan band
(lace bryozoans, fan bryozoans, soft corals)
Deep mixed invertebrate band
(Hexacorals, solitary ascideans)
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

Site 6


Algal belt
Encrusting sponge band
Tube worm band
(Galeolarians, soft corals, hydroids)
Mud barren
(lace bryozoans)
Depth (m)
0
2
4
6
8
10
12
14
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

Site 7


Algal belt
Encrusting sponge band
(yellow sponge, mussels)
Tube worm band
(Galeolarians)
Deep mixed invertebrate band
(stony corals, small sponges, ascideans)
Depth (m)
0
5
10
15
20
25
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 50
Distance from shore (m)

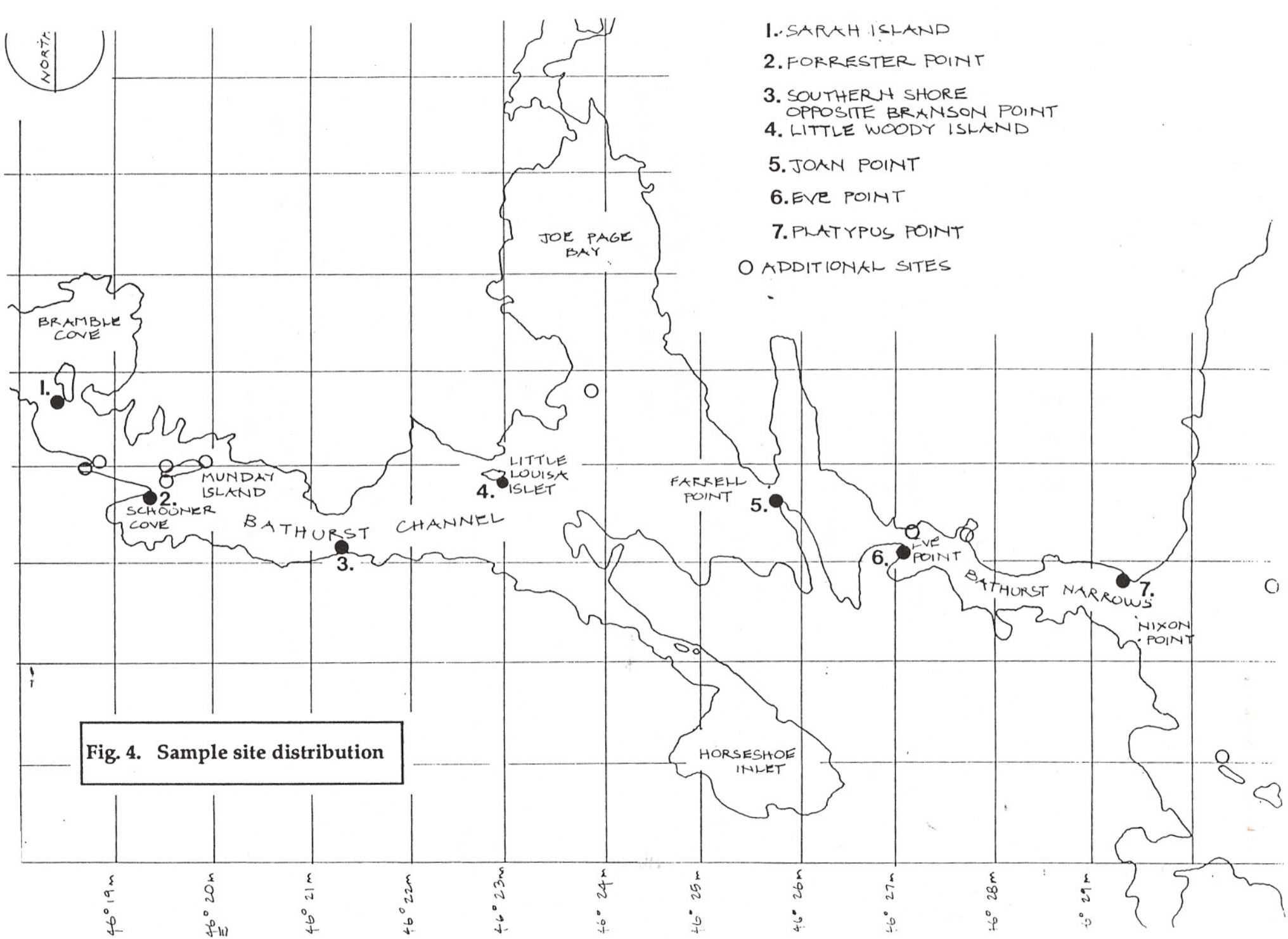


Fig. 4. Sample site distribution

* upper layer dominated by encrusting sponges and mussels (Mytilus); this band becomes broader toward upper estuary.

* broad band below sponge layer at mid estuary (sites 4 & 5) dominated by bryozoans. Dominant elements include three species of lace bryozoans (phidolophids). The upper part (3-6 m) of this band also contains dense aggregations of fan bryozoans (Adeonellopsis).

* band below sponge layer (3-7 m) at sites 6 & 7 dominated by tube worms (galeolarians). Lace bryozoans (phidolophids) dominate below this band.

* deep sections of main channel with a few stony corals (Balanophyllia).

* isolated patches of soft corals and hydroids in bands at 4-6 m at sites 4-6.

* site 3 mainly muddy substrate with very sparse fauna; anemones (Cerianthus) were the dominant macroinvertebrate.

iii) Benthic communities (quantitative features) -

Edgar, G.J., Barrett , N., and N. Mooney

In this section of the study we report the results of a quantitative survey of fishes and benthos along a transect from Saddle Bight, on the western shore of Port Davey, to Celery Top Islands in Bathurst Harbour. The aim of this study was twofold, to provide baseline information on the abundances of common plant and animal species at fixed sites in the region so that significant future changes in community structure can be identified, and to quantitatively describe changes in the biota along the estuarine gradient.

Data on the abundances of organisms recorded during each transect have been summarised in Tables 1, 2 and 3. Only one fish species, the goby Nesogobius hinsbyi, has not been recorded previously during other surveys around the Tasmanian coast (DSF data). This species is widespread elsewhere but has presumably not been recorded because it is associated with soft sediments rather than reef, and only in the Bathurst Channel region have censused reefs been overlain with silt. Fish species richness was highest near the entrance to Bathurst Channel (Table 1), but even in this area species numbers were low in

comparison to other sites around Tasmania (DSF data). The inner Bathurst Channel and Port Davey sites were the poorest so far investigated in terms of both fish species richness and abundance.

The abundance and species richness of large invertebrates were also highest near the western entrance of Bathurst Channel (Table 2), with very few mobile animals in Bathurst Harbour and the eastern section of Bathurst Channel. Sessile invertebrates occurred in high densities throughout Bathurst Channel but were low in Bathurst Harbour (Table 3). The sessile animals recorded in Bathurst Channel formed an assemblage quite different from those recorded elsewhere around Tasmania in 5 or 10 m water depths, all of which have been dominated by plants rather than animals. Plants were dominant at the two Port Davey sites, but were not recorded at 5 m depth at any site east of Sarah Island. One of the common algal species in Port Davey, Lenormandia muelleri, has not been recorded during other quantitative surveys.

One of the stated aims of this component of the project was to provide baseline information on plant and animal abundances at fixed sites so that significant future changes in the biota can be recognized. This aim was partly achieved; however, the survey should be repeated at the same sites on at least one more occasion so that natural variability in densities within a site can be assessed. Without such duplicated data, it is not statistically possible to identify whether future biotic changes at these sites are due to recent impacts, or to natural fluctuations in population numbers.

The surveys were also limited by time constraints in being standardized at 5 m depth. This depth was chosen so that data were comparable with that collected by DSF; however, for the distribution of organisms along Bathurst Channel to be fully documented, surveys should also be carried out at other depths. Such data is partly available in the unpublished 1989 report "Hydrological and ecological survey of the Port Davey/Bathurst Harbour estuary, 1988-1989" by G. Edgar.

The results of our survey were consistent with the earlier 1988-89 study in identifying abrupt community changes between Port Davey and Sarah Island, and between Sarah Island and Little Woody Island. As suggested in the earlier study, these changes are probably associated with the poor light penetration through the tannin-stained surface waters. Insufficient light was apparently available for any macroalgae to survive at depths greater than 5 m east of Schooner Cove. Because of this lack of algae, sessile animals that

Table 1. Estimated densities (per 100 m^2) of fishes at various sites between Saddle Bight (Port Davey) and Celery Top Island (Bathurst Harbour). Asterisks indicate estimates obtained using the smaller 50 m^2 transect.

	Saddle Bight	Breaksea Island	Sarah Island	Schooner Cove	Little Woody Is.	Boat Crossing	Eve Point	Celery Top Island
Conger verreauxi				0.05				
Pseudophycis bacchus			0.05	0.15	0.05	0.05		
Paratrachichthys trailli				0.05				
Gnathanacanthus goetzii	0.5*							
Scorpaena ergastulorum	1.0*		0.05	1.0*				
Neosebastes scorpaenoides			0.05					
Platycephalus bassensis								0.1
Vincentia conspersa			0.1	0.8	0.1	0.8	2.0*	0.5*
Cesioperca lepidoptera				0.5				
Arripis sp.				0.05				
Trachinops caudimaculatus			1.6	17.2				
Dinolestes lewini		0.15						
Trachurus declivis		12.5						
Dactylosargus arctidens	0.05			0.1				
Neoodax balteatus				0.05	0.05			
Notolabrus fucicola	1.85	2.65	0.3	0.3				
Notolabrus tetricus			0.05	0.05				
Pseudolabrus psittaculus			0.2	0.15				
Nesogobius hinsbyi			0.15		2.5*	0.5*	0.05	
Meuschenia australis	0.05		0.05					
Aracana aurita				0.1				
Diodon nichthemerus	0.05					0.05	0.05	

Table 2. Densities (per 100 m^2) of mobile invertebrates at various sites between Saddle Bight (Port Davey) and Celery Top Island (Bathurst Harbour).

	Saddle Bight	Breaksea Island	Sarah Island	Schooner Cove	Little Woody Is.	Boat Crossing	Eve Point	Celery Top Island
Comanthus tasmaniae		0.5						
Conocladus australis			2.0	3.0				
Goniocidaris tubaria		0.5	43	10	0.5	1.5	1.0	
Heliocidaris erythrogramma			6.0	28				
Nectria ocellata	1.0							
Pentagonaster duebeni		1.0	1.0	0.5				
Petricia vernicina	4.0							
Stichopus mollis				0.5				
Tosia magnifica			1.5	1.5	2.0	2.0	2.0	
Jasus edwardsii				1.0		0.5	0.5	
Nectocarcinus tuberculosus	0.5							
Plagusia chabrus	4.5	1.5	1.0	0.5	0.5			
Amorena undulata				1.5	0.5			
Haliotis rubra				0.5				
Octopus sp.								0.5
Penion mandarinus			0.5					
Pleuroploca australasiae	12.5	1.5	0.5					
Thais orbita		1.0						
Turbo undulatus	1.0							
Total invertebrates	23.5	6.0	55.5	47.0	3.5	4.0	3.5	0.5

Table 3. Estimated cover (%) of plants and sessile animals at various sites between Saddle Bight (Port Davey) and Celery Top Island (Bathurst Harbour).

	Saddle Bight	Breaksea Island	Sarah Island	Schooner Cove	Little Woody Is.	Boat Crossing	Eve Point	Celery Top Island
Invertebrates								
Mytilus edulis planulatus							0.2	
Barbatia pistacia						0.1	0.6	
Other bivalves					0.2			
Barnacles						0.6	1.7	
Serpulid polychaetes						0.7	3	
Botrylloides magnicoecus				0.4				
Other ascidians		0.3	1.1	0.8	0.1		0.6	0.1
Capnella sp.		0.1		0.7	0.3	8.3	4.8	
Other alcyonarians			0.8	1.7	0.6	0.1		
Mopsea whiteleggei			1.2	0.2				
Primnoella australasiae				2.2				
Other gorgonaceans			0.4					
Cartierospongia caliciformis			1.9	2.6				
Other sponges		1	8.6	5.1	1.1	2.1	6.9	
Hydroids							0.7	
Bryozoans	0.3	0.5	21.2	4.6	7.5	9.8	20	
Algae								
Codium pomoides		0.1	0.1					
Caulerpa geminata		1.2	3					
Carpoglossum confluens	0.2	15.4						
Cystophora platylobium	4.1	0.6						
Durvillaea pototorum	4.2							
Ecklonia radiata	3.1	26.8						
Lessonia corrugata	8.9							
Phyllospora comosa	33.5							
Sargassum sp.	0.6							
Xiphophora gladiata	10.9							
Zonaria sp.	0.1	0.1						
Ballia callitricha	4.2	0.7						
Dictymenia harveyana			0.1					
Euptilota articulata	0.7							
Hemineura frondosa	0.7							
Hypnea episcopalis	0.9							
Jeannerettia lobata	2.1							
Lenormandia marginata			0.3					
Lenormandia muelleri	4.0	2.2						
Phacelocarpus labillardieri	3.3	7.3						
Plocamium angustum	8.0	1.7	1.6					
Plocamium cartilagineum	0.3							
Plocamium dilatatum		0.1						
Ptilonia australica	0.4	6.0						
Sonderopelta coriacea		8.3						
Thamnoclonium dichotomum		3.4	12.6	1.9				
Coralline algae	1.9	0.8						
Other rhodophytes	16.3	1.5	0.8					
Total sessile invertebrates	0.3	1.9	35.2	18.3	9.8	21.7	38.5	0.1
Total plants	108.0	76.2	18.5	1.9	0	0	0	0

ble 4. Site information for primary sampling stations in Bathurst Channel.

cation	Sarah Island	Forrester Point	Cave Point	L. Woody Is	Joan Point	Eve Pt	Platypus Point
tion no	1	2	3	4	5	6	7
te sampled (1993)	4-Apr	5-Apr	3-Apr	2-Apr	7-Apr	6-Apr	7-Apr
ne (hrs)	1100	1140	1200	1500	1020	1040	1310
nd (dir./strth)	E2	0	W1	E2	NW5	SW6	W7
a state	calm	calm	calm	slight chop	choppy	choppy	sheeting
bidity (m)	2.2	2	2.4	2.30	1.8	1.7	1.4
ocline depth (m)	2	2.1-2.5	2.5	2.5	1.1,5.5,13.5	1.8	7

are normally outcompeted for space by algae were abundant. These animals appeared to be most prolific in areas with strong current flow. At Little Woody Island and in Bathurst Harbour where currents were weak, few sessile animals were recorded. Few sessile animals were also recorded in Port Davey where algae covered virtually all available space.

iv) Taxonomic collections -

Gowlett-Holmes, K.L. and W. Zeidler

In general, the fauna of Bathurst Channel and Bathurst Harbour is atypical when compared with reef areas at similar depths in other areas of Tasmania. The zonation with depth and changes in communities up Bathurst Channel have been dealt with by other expedition members.

Generally, on the rock slope areas sampled, the community was dominated by sponges in shallow water, often with mussels, giving way to soft corals, then to seawhips, particularly on the outer stations, with other octocorals and sponges. A variety of bryozoans were found at all but the shallowest of depths. Seapens dominated soft substrate areas on the outer stations, and tube anemones were found in mud on most stations, and were very common on some. Detailed sampling for mud/silt infauna was not undertaken.

Detailed identifications of many groups are yet to be done. This reflects the lack of taxonomic expertise available in Australia at present, as there are no Australian experts available for many groups, and those there are have heavy workloads and several have been unable to deal with this material in detail as yet. Some groups have been already sent to overseas experts, and more will be when willing workers are found. Detailed species list for each station will be supplied when available.

The sponges are yet to be identified. The soft corals belong to the family Nephtheidae, probably to the genus Capnella, but this has yet to be confirmed. The seapens are Sarcoptilus grandis, family Pteroididae, identified by Gary Williams, California Academy of Sciences. This species is wide spread in southern Australia, but is rarely found in such dense aggregations as those in areas of Bathurst Channel. The tube anemone is an

unidentified species of Cerianthus (Cerianthidae), that is rarely as numerous as it is in Bathurst Channel.

The following gorgonacean identifications were all done by Phil Alderslade of the Northern Territory Museum of Arts and Sciences, Darwin. The large, dominant seawhips are Primnoella australasiae (Primnoidae), a species common in other parts of Tasmania. However, this species is found in depths as shallow as 5–12 m in Bathurst Channel, whereas it is usually found in depths of 30 m+ elsewhere. Another seawhip species, Primnoella grandisquamis, was found in 10–12 m depth in Schooner Cove, Bathurst Channel, all previous records were from 40–150 fathoms. The dominant Isididae octocoral was previous identified as Mopsea whiteleggei, a species now known to be restricted to north of Gabo Island. The Bathurst Channel species is now known to be a species called 'plumacea', shortly to be placed in a new genus, and is a different species to the main isidids found in diveable depths elsewhere in Tasmania. Nov. gen. plumacea is found in depths as shallow as 5–12 m in Bathurst Channel, whereas all previous records were from 60–220 m. Of the smaller octocorals, two species of the family Melithaeidae were found, an unidentified species of Acabaria and an aberrant species (PH0091) which may represent the first new genus in this family for 150 years. It is possible that the latter is endemic to the area, as it is quite unlike any other known melithaeid. An unidentified species of Clavularia (Clavulariidae), a stoloniferous octocoral, was quite common in many areas of solid substrate in Bathurst Channel.

A wide variety of cheilostome and cyclostome bryozoans were found on rock substrates in Bathurst Channel. Preliminary identifications of the Bryozoa are by Steven Hageman, a post-doctoral fellow of the University of Adelaide. In Bathurst Channel, the bryozoans, although less obvious than the octocorals and sponges, dominate the rock substrates at most depths, and are probably the major contributors of carbonates to the sediments of the area. The dominant species are two unidentified lace bryozoans of the family Phidoloporidae, which form fenestrate aggregations. Another major species is Caleschara denticulata (Microporidae), which is growing in its foliose form in depths as shallow as 6–8 m in this area. Stach (1936, J. Geol. 44:60–5) cites this species as growing in this form only in depths of 30–200 fathoms, in shallower water it usually grows in a digitate form. Other bryozoans form smaller colonies but are still present in very large numbers. Other bryozoans that have been identified so far are an Adeonellopsis sp. (Adeonidae), found in this area as shallow as 5–10 m, but usually found in excess of 50 m depth, and two species of Hornera (Horneridae), which are the dominant fenestrate cyclostome

bryozoans in this area. The bryozoans are the major contributors to modern carbonate sediments, and appear to have been in the past also. The bryozoan fauna of Bathurst Channel is a deep water fauna found here in unusually shallow water, representing an unique study opportunity. Dr. Yvonne Bone and her colleagues at the University of Adelaide, Geology Department, are currently studying modern carbonate sediment formation on the continental shelf and slope of southern Australia, where bryozoans are the major contributors to these sediments, and many of the bryozoans found in Bathurst Channel are the same as those they are studying offshore. The formations of bryozoans in Bathurst Channel are extremely delicate, with the fenestrate and foliose species forming aggregations that are also an important habitat for many smaller species, particularly crustaceans. These aggregations are easily broken and dislodged even by a diver passing close and not even touching them, and could be seriously damaged by increases in diving activity in the area.

Two species of stony coral were relatively common on several stations, the colonial Culicia hoffmeisteri (Rhizangiidae) and the solitary Balanophyllia bairdiana (Dendrophylliidae). The undescribed species of golden zoanthid anemones common in other parts of Tasmania was patchily distributed on rocky substrates in Bathurst Channel.

The two major bivalve molluscs in the area are the mussel found in shallow water, Mytilus edulis (Mytilidae) and the ark shell, Barbatia pistachia (Arcidae), found on rock slopes from about 3 m depth. Shelled gastropod molluscs are generally uncommon and mainly small. The two main opisthobranch species found were Pleurobranchaea maculata and Berthella medietas, both in the family Pleurobranchidae. A number of other species of opisthobranchs were collected, but these have yet to be identified. Cephalopods were uncommon, and included the large Octopus maorum (Octopodidae) and a small unidentified species of bottle-tailed squid in the genus Sepiadarium (Sepiadariidae). In general molluscs were scarce.

The main sea stars found were the biscuit sea star Tosia magnifica (Goniasteridae) and the rough sea star Uniophora granifera (Asteriidae). Other asteroids collected included Nectria ocellata (Oreasteridae), Tosia australis and Pentagonaster duebeni (both Goniasteridae). The commonest echinoderms was a sea urchin of the family Cidaridae, possibly in the genus Histiocidaris, the basket sea star Conocladus australis (Gorgonocephalidae) and several as yet unidentified holothurians.

The most common crustaceans collected while diving was an unidentified species of spider crab (Majidae) and a shrimp tentatively identified as Palaemon intermedius (Palaemonidae). Several crabs of the family Leucosiidae were collected but have yet to be identified. Scavenging crustaceans collected in baited traps set overnight were predominantly an unidentified species of the isopod family Cirolanidae and a large species of unidentified ostracod. The latter is of particular interest, as the ostracod fauna of our waters is poorly known, and this species is obviously a dominant scavenger in this area.

In summary, the invertebrate fauna of Bathurst Channel and Bathurst Harbour is atypical compared with reef areas at similar depths in other parts of Tasmania. The waters of this system appear to be virtually isolated from neighbouring Port Davey, and nutrient poor. Water chemistry and other oceanographic studies are needed to establish the relationship of this system to Port Davey proper. The benthic invertebrate fauna is dominated by cnidarians, particularly octocorals, and bryozoans, and many of the species present are more commonly found in much deeper water elsewhere. This trend will undoubtedly be reflected when more of the species present are identified in more detail. Bathurst Channel represents a unique opportunity for a deep-water community to be studied at depths easily accessible to SCUBA diving, without severe limits on bottom time. The area is not subject to wave-action or swell, and although the surface waters are subject to freshwater outflow and wind-generated chop, the waters below the tannin layer are generally subject only to tidal currents. The benthic communities are therefore fragile, and very vulnerable to outside disturbance.

The current survey was limited to the more obvious and more easily collected species, due to limited available time and equipment. More detailed sampling is necessary to establish a truer record of the invertebrate fauna, this needs to be done by experienced, expert collectors. Less obvious species are not necessarily less important in the community structure, and alternative sampling methods are needed for particular groups, e.g. soft bottom infauna. The bryozoans in particular need further work, as an understanding of the structure, growth rates etc. of these would be of enormous help in understanding how and at what rate modern carbonate sediments are being formed on the continental shelf.

Future Research:

Identification of specimens taken during this survey will continue for the remainder of 1994. Consequently, in only a few instances have community components been identified to species. Also, vital information on sub-assemblage structure must be obtained before the Channel communities can be adequately defined. Future research should focus on the following issues -

* To refine a preliminary zonation structure map of the Channel based on the 1993 survey

* To further identify the species composition of these unique assemblages

* To identify dive sites that demonstrate the community structure of the Channel but which are less vulnerable to mechanical damage from divers

* To map the distribution of fragile macroinvertebrate epibenthos (ie gorgonias and sea pens) that is likely to be susceptible to dredge and anchor damage

* To define patterns of water flow in the Channel and Harbour in order to predict possible effects of nutrient input to the system

* Obtain pictorial representations, both through transparencies and video, for identifying key species and for educational purposes

Acknowledgements:

This research was funded by a Wilderness Ecosystems Baseline Studies Grant. Significant field-based assistance was provided by Mr. C. Baars and Mr. N. Smith aboard the vessel 'Wildwind'. The algae were identified by Mr C. Sanderson with assistance from Ms A. McGeary-Brown. Mr P. Cusick produced the hydrological figures.

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